BASIL, SWEET (*Ocimum basilicum*)
Downy mildew; *Peronospora belbahrii*

M. T. McGrath and C. T. Downing
Plant Pathology & Plant-Microbe Biology Section
SIPS, Cornell University, LIHREC
3059 Sound Avenue, Riverhead, NY 11901

Evaluation of an experimental and commercial cultivars of sweet basil resistant to downy mildew, 2021.

An experiment with field-grown basil was conducted at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead, NY, in a field with Haven loam soil. The field was moldboard plowed on 29 May. Controlled-release fertilizer (N-P-K, 19-10-9) was broadcast at 525 lb/A (101 lb/A N) over the bed area and incorporated on 30 Jun. Beds were formed with drip tape and covered with black plastic mulch on 30 Jun. Weeds between mulched beds were managed by cultivating, covering the soil with landscape cloth, and by hand weeding. A waterwheel transplanter was used to make planting holes in the beds and apply starter fertilizer (9-18-9). A late planting date was used for the experiment to increase the likelihood of downy mildew developing during the experiment. The primary source of initial inoculum in this area is considered to be sporangia dispersed by wind from infected plants potentially a long distance away. Basil for the experiment was seeded in trays in a greenhouse on 8 Jun. All plants were placed outdoors to harden for a few days and then transplanted in the field by hand on 7 Jul. No fungicides were applied. A randomized complete block design with four replications was used. Each plot had 8 plants in 6-ft rows with 9-in. in-row plant spacing. The plots were 3 ft apart in the row. Downy mildew was assessed in all plots weekly from 13 Aug through 20 Sep, and then Prospera varieties only from 30 Sep through 15 Oct. Incidence of plants with symptoms (sporulation of the pathogen visible on the underside of leaves) was recorded and percentage of leaves per plant with symptoms was estimated for each plant in each plot. Area under the disease progress curve (AUDPC) values were calculated from 13 Aug to 7 Sep using the formula: $\sum n_{i=1}[(R_{i+1} + R_i)/2] [t_{i+1} - t_i]$, where R = disease incidence rating (% leaves with symptoms on affected plants) at the *i*th observation, t_i = time (days) since the previous rating at the *i*th observation, and n = total number of observations. Defoliation was assessed on 3 and 15 Sep for all plots, and 30 Sep, 5 Oct, and 15 Oct for Prospera varieties only. Data were analyzed with one-way ANOVA and Tukey's HSD to separate means using JMP statistical software. Average monthly high and low temperatures (^{o}F) were 82.0 and 67.4 in Jul, 83.4 and 68.4 in Aug, 77.1 and 62.5 in Sep, and 69.1 and 54.7 in Oct. Rainfall (in.) was 6.2, 9.0, 4.8 and 6.4 for these months, respectively. Results may have been impacted by storms, in particular remnants of Hurricane Henri on 22 Aug and Hurricane Ida on 2 Sep.

Symptoms of downy mildew were first observed in this experiment on 13 Aug in four of the 36 plots; none were observed on 23 Jul or 3 Aug. Very few leaves with symptoms of downy mildew were observed on the Prospera cultivars, Genesis 164 (an experimental cultivar related to Prospera with an additional gene for resistance), and Pesto Besto. Similar results were obtained in 2020 with Prospera and Amazel, which was developed by the breeder of Pesto Besto (PDMR 15:V069). In contrast, although symptoms were first seen around the same time (17 Aug 2020), symptoms became more widespread on the Rutgers DMR cultivars earlier in 2021 than in 2020, when incidence of affected leaves on 28 Aug was 89% on DiGenova and 0% on Rutgers Devotion DMR and Rutgers Passion DMR. Symptoms did increase on the Rutgers cultivars during Sep 2020. While incidence of affected leaves was high on these cultivars in 2021, defoliation on 3 Sep was very low in contrast with the susceptible control reflecting differences in severity. However, a basil leaf with any amount of symptoms is unmarketable for fresh herbs. An integrated management program with fungicides applied to a Rutgers cultivar is expected to provide excellent control. Two major storms occurred: remnants of Hurricane Henri on 22-23 Aug (2.6 in. rain) and Hurricane Ida on 2 Sep (3.3 in.). Plant damage was evident on 3 Sep. Plants in some plots had too many broken branches to be able to rate the plot starting with the 15 Sep assessment (data not analyzed). The severely damaged plots were three of Prospera PS5, two of Pesto Besto and one of Prospera ILL2. The four Prospera varieties were examined on 30 Sep, 5 Oct, and 15 Oct to determine if more leaves would eventually become affected because there had been reports of downy mildew becoming severe on Prospera elsewhere in the northeast in 2021. No symptoms were observed.

Cultivar	Incidence of downy mildew (%) [*]						Defoliation (%) [*,**]
	Affected plants [**]		Affected leaves on affected plants				
	18 Aug	26 Aug	18 Aug [**]	26 Aug	7 Sep [**]	AUDPC [**]	3 Sep
DiGenova (susceptible)	97 a	100 a	13.10 a	99.0 a	99.0 a	1679.4 a	94 a
Rutgers Devotion DMR	23 ab	100 a	1.09 bc	64.7 b	43.4 b	907.3 b	4 b
Rutgers Passion DMR	41 ab	100 a	6.22 ab	61.1 b	27.4 b	696.1 b	4 b
Pesto Besto	8 b	1 b	0.23 bc	0.1 c	0.1 c	3.2 c	0 b
Prospera ILL2	3 b	0 b	0.05 c	0.0 c	0.0 c	0.3 c	0 b
Prospera CG1	1 b	0 b	0.03 c	0.0 c	0.0 c	0.2 c	0 b
Prospera Compact PL4	1 b	0 b	0.03 c	0.0 c	0.0 c	0.2 c	0 b
Prospera Compact PS5	3 b	2 b	0.04 c	0.1 c	0.3 c	1.3 c	0 b
Genesis 164	2.3 b	0 b	0.03 c	0.0 c	0.0 c	2.3 c	0 b
P-value (cultivar)	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

[*] Numbers in each column with a letter in common are not significantly different from each other (Tukey's HSD, *P*=0.05).
[**] Values were square root transformed before analysis because raw data were not distributed normally. Table contains de-transformed values.